

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims

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We Claim:

Claim 1 (currently amended): A cooling system for cooling a circuit board including a first heat source and a second heat source, ~~wherein the first and second heat sources extend to different heights with respect to the circuit board,~~ comprising:

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a layer of thermally conductive material applied to the circuit board, the layer in conforming thermal contact with the first and second heat sources; and
a thermal conduit in thermal contact with the layer, the thermal conduit being configured for dissipating heat from the layer; and
an actuator configured to actuate the thermal conduit into thermal contact, via the layer, with the first and second heat sources.

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Claim 2 (original): The cooling system of claim 1, wherein the layer is composed of solidified foam conformingly received over the first and second heat sources.

Claim 3 (original): The cooling system of claim 2, wherein the layer is composed of solidified foam formed by applying a coating of foam over the first and second heat sources prior to its solidification.

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Claim 4 (currently amended): The cooling system of claim 1, wherein ~~the thermal conduit includes~~

— a cooled body; and

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— an the actuator is configured to actuate the cooled body thermal conduit into conforming thermal contact with the layer.

Claim 5 (currently amended): The cooling system of claim 4, wherein the cooled body is thermal conduit includes a roll bond panel.

5 Claim 6 (currently amended): The cooling system of claim 4, wherein the cooled body is a plate thermal conduit includes a body defining passageways configured for cooling fluid.

10 Claim 7 (currently amended): The cooling system of claim 6, and further comprising a pump and a heat exchanger in fluid communication with the passageways defined ~~in the plate~~ by the body to form a liquid loop cooling system.

15 Claim 8 (currently amended): The cooling system of claim 1, wherein the layer ~~defines passageways configured for cooling fluid~~ thermal conduit includes walls that define cooling fluid passageways through the layer.

Claim 9 (currently amended): The cooling system of claim 8, and further comprising a pump and a heat exchanger in fluid communication with the passageways ~~defined in~~ through the layer to form a liquid loop cooling system.

20 Claim 10 (currently amended): The cooling system of claim 1, wherein ~~the thermal conduit includes~~

— ~~a cooled body thermodynamically connected to the layer, and~~
— ~~an~~ the actuator is configured to actuate the layer into conforming thermal contact with the first and second heat sources.

25 Claim 11 (original): The cooling system of claim 10, wherein the layer is composed of foam formed by machining a solid foam body to substantially conform to the first and second heat sources.

30 Claim 12 (currently amended): The cooling system of claim 10, wherein the cooled body is thermal conduit includes a roll bond panel.

Claim 13 (currently amended): The cooling system of claim 10, wherein the cooled body is a plate thermal conduit includes a body defining passageways configured for cooling fluid.

5 Claim 14 (currently amended): A cooling system for cooling a circuit board including a first heat source and a second heat source, ~~wherein the first and second heat sources extend to different heights with respect to the circuit board,~~ comprising:

10 a means for transferring heat, ~~applied to the circuit board, the means for transferring~~ being in conforming thermal contact with the first and second heat sources; ~~and~~

a thermal conduit in thermal contact with the means for transferring heat, the thermal conduit being configured for dissipating heat from the means for transferring heat; and

15 an actuator configured to actuate the thermal conduit into thermal contact, via the means for transferring heat, with the first and second heat sources.

Claim 15 (currently amended): ~~A~~ The cooling system for cooling a circuit board including a first heat source and a second heat source, ~~wherein the first and second heat sources extend to different heights with respect to the circuit board,~~ comprising:

20 ~~— a layer of thermally conductive material applied to the circuit board, the layer in conforming thermal contact with the first and second heat sources; and~~

25 ~~— a thermal conduit in thermal contact with the layer, the thermal conduit being configured for dissipating heat from the layer~~ of claim 14, wherein the means for transferring heat is a unitary pad of thermally conductive material.

Claim 16 (currently amended): A cooled circuit board system, comprising:
a board configured for electrically connecting components for
communication;

5 a first component heat source mounted on and in electrical communication
with the board;

a second component heat source mounted on and in electrical
communication with the board; and

a layer of thermally conductive material ~~attached to~~ and in conforming
thermal contact with the first and second heat sources;

10 a thermal conduit in thermal contact with the layer, the thermal conduit being
configured for dissipating heat from the layer; and

an actuator configured to actuate the thermal conduit into thermal contact,
via the layer, with the first and second heat sources.

15 Claim 17 (currently amended): The cooled circuit board system of claim 16,
wherein the layer is composed of solidified foam conformingly received over the
first and second heat sources.

20 Claim 18 (currently amended): The cooled circuit board system of claim 17,
wherein the layer is composed of solidified foam formed by applying a coating of
foam over the first and second heat sources prior to its solidification.

25 Claim 19 (currently amended): The cooled circuit board system of claim 16,
wherein ~~the thermal conduit includes~~

~~_____ a cooled body; and~~

~~_____ an the actuator is configured to actuate the cooled body thermal conduit into
conforming thermal contact with the layer.~~

30 Claim 20 (currently amended): The cooled circuit board system of claim 19,
wherein the ~~cooled body is~~ thermal conduit includes a roll bond panel.

Claim 21 (currently amended): The cooled circuit board system of claim 19, wherein the ~~cooled body is a plate~~ thermal conduit includes a body defining passageways configured for cooling fluid.

5 Claim 22 (currently amended): The cooled circuit board system of claim 21, and further comprising a pump and a heat exchanger in fluid communication with the passageways defined ~~in the plate~~ by the body to form a liquid loop cooling system.

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10 Claim 23 (currently amended): The cooled circuit board system of claim 16, wherein the ~~layer defines passageways configured for cooling fluid~~ thermal conduit includes walls that define cooling fluid passageways through the layer.

15 Claim 24 (currently amended): The cooled circuit board system of claim 23, and further comprising a pump and a heat exchanger in fluid communication with the passageways ~~defined in~~ through the layer to form a liquid loop cooling system.

Claim 25 (canceled)

Claim 26 (new): The cooled circuit board system of claim 24, and further comprising:

a second board configured for electrically connecting components for communication;

5 a third component heat source mounted on and in electrical communication with the second board;

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a fourth component heat source mounted on and in electrical communication with the second board;

10 a second layer of thermally conductive material in conforming thermal contact with the third and fourth heat sources;

a second thermal conduit in thermal contact with the second layer, the second thermal conduit being configured for dissipating heat from the second layer; and

15 a second actuator configured to actuate the second thermal conduit into thermal contact, via the second layer, with the third and fourth heat sources;

wherein the second thermal conduit includes walls that define cooling fluid passageways through the second layer; and

wherein the pump and the heat exchanger are also in fluid communication with the passageways through the second layer.

20 Claim 27 (new): The cooled circuit board system of claim 16, wherein the actuator is configured to actuate the layer into conforming thermal contact with the first and second heat sources.

25 Claim 28 (new): The cooling system of claim 27, wherein the layer is composed of foam formed by machining a solid foam body to substantially conform to the first and second heat sources.

30 Claim 29 (new): The cooling system of claim 27, wherein the thermal conduit includes a roll bond panel.

Claim 30 (new): The cooling system of claim 27, wherein the thermal conduit includes a body defining passageways configured for cooling fluid.

5 Claim 31 (new): The cooling system of claim 27, wherein the first and second heat sources extend to different heights with respect to the circuit board, wherein:

the layer is configured to compliantly adapt to the difference between the heights of the first and second heat sources when the actuator is actuated to place the thermal conduit into thermal contact, via the layer, with the first and second heat sources.

10 Claim 32 (new): The cooling system of claim 31, and further comprising a stop, wherein the stop is configured to limit the actuation of the thermal conduit so as to prevent the application of excessive force on the heat sources.

15 Claim 33 (new): The cooling system of claim 19, wherein the first and second heat sources extend to different heights with respect to the circuit board, wherein:

the layer extends up from the heights of the first and second heat sources to a third height; and

20 the actuator is configured to actuate the thermal conduit into contact with the layer at the third height.

Claim 34 (new): The cooled circuit board system of claim 22, and further comprising:

a second board configured for electrically connecting components for communication;

5 a third component heat source mounted on and in electrical communication with the second board;

a fourth component heat source mounted on and in electrical communication with the second board;

10 a second layer of thermally conductive material in conforming thermal contact with the third and fourth heat sources;

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a second thermal conduit in thermal contact with the second layer, the second thermal conduit being configured for dissipating heat from the second layer; and

15 a second actuator configured to actuate the second thermal conduit into thermal contact with the second layer;

wherein the second thermal conduit includes a second body defining passageways configured for cooling fluid; and

wherein the pump and the heat exchanger are also in fluid communication with the passageways defined by the second body.

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Claim 35 (new): A cooled circuit board system, comprising:

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a circuit board including a first heat source and a second heat source; and
a layer of thermally conductive material solidified on the circuit board, the layer being in conforming thermal contact with the first and second heat sources;
25 wherein the layer defines passageways configured for cooling fluid for dissipating heat from the layer.

Claim 36 (new): The cooled circuit board system of claim 35, wherein the thermally conductive material is solidified foam.

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Claim 37 (new): The cooled circuit board system of claim 35, wherein the first and second heat sources extend to different heights with respect to the circuit board,

Claim 38 (new): The cooled circuit board system of claim 35, and further comprising a pump and a heat exchanger in fluid communication with the passageways defined by the layer, to form a liquid loop.

5 Claim 39 (new): The cooled circuit board system of claim 38, and further comprising:

a second circuit board including a third heat source and a fourth heat source; and

10 a second layer of thermally conductive material solidified on the second circuit board, the second layer being in conforming thermal contact with the third and fourth heat sources;

wherein the second layer defines passageways configured for cooling fluid for dissipating heat from the second layer; and

15 wherein the pump and the heat exchanger are also in fluid communication with the passageways defined by the second layer.

Claim 40 (new): The cooled circuit board system of claim 35, for use with a source of cooling fluid, and further comprising:

20 an input port configured for detachably placing the passageways in fluid communication with the source of cooling fluid.

Claim 41 (new): The cooled circuit board system of claim 40, for use with additional electrical components, and further comprising:

25 an electrical connector configured for detachably placing the circuit board in electronic communication with the additional electrical components.

Claim 42 (new): The cooled circuit board system of claim 41, and further comprising:

30 an enclosure configured to enclose the circuit board and the layer of thermally conductive material.

Claim 43 (new): A cooled circuit board system, for use with a source of cooling fluid, comprising:

- 5 a circuit board including a first heat source and a second heat source;
a layer of thermally conductive material in conforming thermal contact with the first and second heat sources, wherein the layer defines passageways configured for passage of cooling fluid for dissipating heat from the layer; and
an input port configured for detachably placing the passageways in fluid communication with the source of cooling fluid.

10 Claim 44 (new): The cooled circuit board system of claim 43, for use with additional electrical components, and further comprising:

- an electrical connector configured for detachably placing the circuit board in electronic communication with the additional electrical components.

15 Claim 45 (new): The cooled circuit board system of claim 44, and further comprising:

- an enclosure configured to enclose the circuit board and the layer of thermally conductive material.

20 Claim 46 (new): A method of making a cooled circuit board, comprising:

- mounting a first component heat source and a second component heat source to be in electrical communication with a circuit board configured for electrically connecting components;

- 25 solidifying a layer of non-solidified thermally conductive foam over the first and second heat sources and a body configured to form a passageway for a cooling fluid, such that the solidified layer places the body in thermal contact with the first and second heat sources.

Amendments to the Drawings

The attached sheet of drawings includes changes to FIG. 7. This sheet, which includes only FIG. 7, replaces the original sheet, which only included FIG. 7.

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Attachment: Replacement Sheet